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AUTHOR	Haury, David L.; Milbourne, Linda A.
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ABSTRACT

This digest presents an overview of ways that parents can encourage their child's learning in science. National and state standards for science knowledge and skills are discussed. The importance of parental guidance and encouragement in all subjects--science in particular--is also discussed. Suggestions are made for setting a good example, helping children see the science around them, providing a place and resources to study, and helping with science homework. Over 20 Internet resources related to supporting students' science learning are listed. (WRM)

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Being "scientific" involves being curious, asking how things happen, and learning how to find the answers. Curiosity is natural to children, but they need help understanding how to make sense of what they see. All we need is a willingness to observe and learn with them, and, above all, to make an effort and take the time to nurture their natural curiosity.
http://www.pmct.org/science.html

Guidelines and resources presented here are intended to help willing parents nurture interest and success in science among their children.

What are Children Learning in Science?

Each school has its own science program and expectations, but most are aligned with state curriculum frameworks or guidelines that are, in turn, strongly influenced by national standards. *National Standards for Science Education* were developed by the National Research Council (see *http://www.nas.edu/nrc/*). The *Standards* present unifying concepts and processes that pertain to science at all grade levels, as well as specific content standards at each grade range for (a) science as inquiry, (b) life science, (c) physical science, (d) earth and space science, (e) science and technology, (f) science in personal and social perspectives, and (g) history and nature of science. These standards andothers are summarized online in *The McREL Standards Database* (see http://www.mcrel.org/standards-benchmarks/); select *Table of Contents*, then *Science*.

The American Association for the Advancement of Science (AAAS) has also developed a comprehensive set of guidelines for how students should progress toward science literacy. The *Benchmarks for Science Literacy* (available online at http://project2061.aaas.org/tools/benchol/bolframe.html) are statements about what all students should know and be able to do in science, mathematics, and technology by the end of grades 2, 5, 8, and 12.

A related set of science education standards for nonformal education has also been developed for the National Network for Science and Technology (NNST; see http://www.fourh.umn.edu/educators/research/4h590.html). Clear and comprehensive, these standards describe what scientifically literate youth should know, and a *Checklist for Good Learning* in Part IV of the standards provides helpful questions for evaluating science classes and programs.

For a comprehensive listing of resources on national and state standards in science education, see the webpage provided by the Putnam Valley Schools of New York at http://putwest.boces.org/StSu/Science.html.

How Can Parents Help?

Research shows that the level of parent involvement in a child's education is strongly related to the degree of success in school (Henderson & Berla, 1994). "What families do is more important to student success than whether thay are rich or poor, whether parents have finished high school or not, or whether children are in elementary, junior high, or high school" (Robinson, in Paulu, 1995). For general tips on ways to strengthen bonds with children, see the National Parent Teacher Association (PTA) website (select "Get Involved" at *http://www.pta.org/commonsense/2_parents/2_parents.html*).

The importance of family involvement in education led the U.S. Congress to add the following goal to the National Education Goals (*http://www.ed.gov/pubs/parents/Homework/pt11.html*): "Every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children." To that end, the U.S. Department of Education has established the Partnership for Family Involvement in Education program (see *http://pfie.ed.gov*) and provides financial resources to communities for developing programs that serve families. For parents actively working with schools, the PTA has produced "National Standards for Parent/Family Involvement Programs" (Online at *http://pta.org/programs/invstand.htm*).

The National Science Teachers Association (NSTA) provides some specific hints for parents wanting to help their children explore science (see *http://www.nsta.org/parents/*). Focusing on skills is important (observing, classifying, predicting, and quantifying), along with asking questions and seeking answers. The NSTA website also identifies some myths about science:

- Myth #1: Science is Difficult. Really, science is not just about knowing a lot of facts and figures, but is a way of seeing the world and solving problems.
- Myth #2: You need to know a lot about science to teach it to your children. Not true! Saying "I don't know; let's find out together" is actually better than giving answers.
- Myth #3: Science Requires Equipment. Actually, science is everywhere, and the best way to begin is through conversation and asking open-ended questions.
- Myth #4: Science skills should wait for reading skills. The developmental skills of preschool children are actually more suited to doing science than reading. Learning about science also can motivate children to read.

Following are more ways that parents can help their children learn science:

Set the Example. One of the most important ways parents can help a child in science is by exhibiting attitudes and values supportive of learning. "All children have two wonderful resources for learning—imagination and curiosity. As a parent, you can awaken your children to the joy of learning by encouraging their imagination and curiosity" (Ravitch, in Kanter, 1994).

Help Children See the Science Around Them. Help children recognize the science of daily life, and engage them in games and activities that foster familiarity with science concepts and scientific thinking. A guide, *Helping Your Child Learn Science*, is available online at *http://www.ed.gov/pubs/parents/Science/index.html*. The guide suggests many activities that parents can do with children (grades K-8) at home and in the community. The activities generally make use of common materials in the home or backyard, or familiar community resources. Here are some other ideas that the guide offers:

- Help children observe objects carefully; this is an important first step toward scientific explanations.
- Encourage children to ask questions; no one knows all the answers, but we can learn to propose answers and test them out.
- Listen to children's ideas and explanations; listening gives them confidence, and expressing their ideas helps them figure out what they know and don't know.

More activities and practical suggestions for strengthening skills and concepts are provided online in another ERIC Digest, *Doing Science With Your Children* (see *http://www.ericse.org/digests/dse94-1.html*).

Provide a Place and Resources to Study. Provide children with convenient, quiet, and comfortable work areas, along with whatever resources are needed to study science and complete assignments. Encourage the use of reference materials (such as dictionaries and encyclopedias), and provide a computer if possible. If a computer is not available in the home, plan regular visits to a public library or community learning center where access is available.

The computer has become a common and essential tool in learning many school subjects, particularly mathematics and science. You and your children can use the computer to:

- Produce reports and assignments using wordprocessing programs, spreadsheets, and other software.

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- Find information from reference materials on CD-ROMS. Many are typically available from school and public libraries.
- Use commercial software packages that teach science concepts and skills in interesting and enjoyable ways.
- Access the abundant science and homework resources and assistance freely available on the Internet.

For help in selecting science software, seek recommendations from one or more of the many websites that provide software reviews. The Educational Software Review page at the SuperKids website (see *http://www.superkids.com*) provides monthly features, annual software awards, an index of all software reviewed, and pertinent articles. For instance, *Fun with Science* is a highly rated set of six multimedia CD-ROMs that resemble an "Eyewitness" book in their composition. Each disk contains an introduction to its subject; sections that explore subjects through animation, illustrations, narration, activities, and videos; and a scrapbook of detailed descriptions, helpful explanations, and interesting facts. *Fun with Science* is appealing to children and draws on their interests and curiosity.

For middle-school children, *Virtual Physics: The Eggs of Time* teaches major physics topics by involving them in a quest to save future generations from the evil plans of the alien Spring-Horns. This popular program teaches an intriguing subject in an engaging manner and is particularly appealing to children who like math and problem-solving activities.

Software reviews are also provided by the North Carolina Department of Public Instruction (see *http://www.evalutech.sreb. org/archives/*). A rating system is not provided, but software programs are thoroughly described, and strengths, weaknesses, and uses are identified.

If you have access to the Internet, there are many helpful websites that provide guidance, resources, or information not readily available in most homes. Both the access to Internet resources and the practice in finding useful resources are valuable. For help in using the Internet, refer either to *The Parent's Guide to the Information Superhighway* (*http://www.pta.org/programs/guide.htm*) or *Parent's Guide to the Internet* (*http://www.ed.gov/pubs/parents/internet/*).

Following are some representative online resources for science:

- Thinking Fountain (*http://www.sci.mus.mn.us/sln/*)
- Cool Science for Curious Kids (*http://www.nhmi.org/coolscience/*)
- How Stuff Works (*http://www.howstuffworks.com/*)
- U.S. EPA's Explorers Club (*http://www.epa.gov/kids/*)
- Exploratorium Science Snacks (*http://quark.fe.up.pt/mirror/www.exploratorium.com/snacks/snacksbysubject.html*)
- Fun Science Gallery (*http://www.funsci.com/*)
- Mom's Favorite Web Sites for Students: Science http://www2.arkansas.net/~mom/science.html
- SciCentral (http://www.scicentral.com/index.html)
- Kid's Science Links (*http://www.duracell.com/Fun_Learning/Kids/index.html*)
- Scientific American's Ask the Experts (*http://www.sciam.com/askexpert/index.html*)
- The Mad Scientist Network (*http://www.madsci.org/*)
- Blue Web'n Applications: Science (http://www.kn.pacbell.com/wired/bluewebn/fr_Science.html)
  Provides descriptions and ratings of websites.

Help with Homework. Teachers assign homework for a variety of reasons: to help students review what has been learned; to help them prepare for the next class session; to extend student exploration of topics more fully than class time permits; or to help students gain skill in self-directed learning and using resources such as libraries and reference materials. Parents can help children get the most out of homework by:

- Encouraging them to take notes about homework assignments when they are given.
- Limiting after-school activities to allow time for homework and family activities.
- Planning a homework schedule with each child that allows some free time when assignments are completed.
- Monitoring television viewing and other potential distractions.
- Doing some assignments or questions together with a child when he or she asks for help.
- Staying nearby—reading, writing, studying or catching up on paperwork.
- Checking completed assignments, and reviewing homework that has been marked and returned.

For more details about these and other homework tips, see *Helping Your Child with Homework* (Paulu, 1995) and *How Important is Homework?* (Available online at *http://www.accessenc.org:81/resources/parent/homewrk.html*). As Weaver (1998) has said, "the entire family needs to cooperate to help students develop good study habits." Before studying, it is also important for "a child...[to] be rested and relaxed after a school day before concentrating on homework. Help the child avoid rushing to finish homework before a deadline such as dinner or bedtime. Try to schedule study time so it doesn't conflict with a favorite activity or necessary function."

There are many homework guidelines and resources available online for both parents and students. For parents having questions about homework or wanting more guidelines, see the following websites:

- Online Homework Helpers (http://www.internetoracle.com/online_homework_helpers.htm)
- National PTA's Education Resource Libraries (*http://www.pta.org/programs/edulibr.htm#home*)
- Apple Learning Interchange: Featured Curriculum Resources (*http://henson.austin.apple.com/edres/parents/pfet/hwrkmenu.shtml*)
- Parentsoup Online Guide (*http://www.parentsoup.com/onlineguide/*)

In addition to the science Internet resources described previously, the following websites offer resources for doing science homework:

- The CSMEE Homework Companion (*http://www.ericse.org/homework.html*)
- Star Tribune Online Homework Help (*http://www.startribune.com/stonline/html/special/homework/*)
- Schoolwork, Ugh! (*http://www.schoolwork.org/*)
- Kids Connect (*http://www.ala.org/ICONN/kidsconn.html*)
- The New "Homework" (*http://fromnowon.org/feb97/teach.html*)
- B.J. Pinchbeck's Homework Helper: Science (http://tnstate.pgh.net/~pinch13/framescience.htm)

References

Henderson, A. T., & Berla, N. (Eds.). (1994). *A new generation of evidence: The family is critical to student achievement*. Washington, DC: National Committee for Citizens in Education. [ED 375 968]

Kanter, P.F. (1994). Helping your child learn math. Washington, DC: U.S. G.P.O. (Available online at *http://www.ed.gov/pubs/parents/Math/title.html*)

Paulu, N. (1995). *Helping your child with homework*. Washington, DC: U.S. G.P.O. (Available online at: *http://www.ed.gov/pubs/parents/Homework/title.html*)

Weaver, M. K. (1998). "Helping" with homework. *Enriching Kansas Families*, October 28.

More Resources

Contact the Eisenhower National Clearinghouse for Mathematics and Science Education (1-800-621-5785) and ask for a copy of *ENC Focus*, 5(3), that focuses on family involvement in education, and explore the ENC website at *http://www.enc.org*. Also, search the ERIC database for more resources on science and homework at *http://www.accessenc.org:81/searchdb/searchdb.html*.

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